Claims

1. Improvement system of energy efficiency for the refrigeration cycle in which refrigerant vapor having low pressure and low temperature is compressed into one having high pressure and high temperature and then is condensed by heat-exchange with circumstances; a condensed refrigerant liquid is expanded and then is evaporated by heat-exchange with a circumstance, and by which a heating and a cooling are performed, comprising of:

an auxiliary heat exchanger unit for heat-exchanging between refrigerant liquid having high pressure and refrigerant vapor having low pressure; and

a cabinet which houses a pressure support value placed at an inlet of an inner pipe of the auxiliary heat exchanger unit, and a pressure of the refrigerant liquid having high pressure condensed at the outdoor heat exchanger is decreased by the pressure support value, and a condensed pressure of the outdoor heat exchanger is maintained.

2. Improvement system of energy efficiency for the refrigeration cycle according to claim 1, wherein: the auxiliary heat exchanger unit makes a heat-exchanging between refrigerant liquid having high pressure and refrigerant vapor having low pressure, and the auxiliary heat exchanger comprising of an inner pipe, one end of which is connected with an exit of the outdoor heat exchanger, the other end of which is connected with an inlet of the expansion valve; an outer pipe accommodating the inner pipe coaxially, one end of which is connected with an exit of the indoor heat exchanger, the other end of which is connected with an inlet of the compressor; and an insulation cover encompassing the outer pipe;

a first pressure support valve is placed at an inlet of an inner pipe of the auxiliary heat exchanger unit, and decreases a pressure of the refrigerant liquid having high pressure condensed at the outdoor heat exchanger, and maintains condensed pressure of the outdoor heat exchanger; and

a cabinet housing the auxiliary heat exchanger and the pressure support valve;

the improvement system of energy efficiency for the refrigeration cycle further comprising of :

a 4 way value for connecting an exit of the compressor, an inlet of the auxiliary heat exchanger unit, one end of the indoor heat exchanger and one end of the outdoor heat exchanger, and for converting flow direction of a refrigerant according to an operation mode;

a second expansion valve connected with one end of the inner pipe of the auxiliary heat exchanger unit, and for expanding a refrigerant condensed at the indoor heat exchanger; and

a second pressure support valve connected with the other end of the inner pipe of the auxiliary heat exchanger unit, a pressure of the refrigerant liquid having high pressure condensed at the outdoor heat exchanger is decreased by the pressure support valve, and a condensed pressure of the outdoor heat exchanger is maintained.

3. Improvement system of energy efficiency for the refrigeration cycle according to claim 2, wherein: the expansion valve, the second pressure support valve, the second expansion valve, and the first pressure support valve are arranged in a row, and further includes a check valve by which only one way flow can be allowed.

4. Improvement system of energy efficiency for the refrigeration cycle according to claim 2, wherein both the expansion valve and the second pressure support valve and both the second expansion valve and the pressure support valve are respectively housed in one body in a row with a distance from each other, the valve group is configured as a dual flow control valve by which bi-directional flows are allowed, and the flow volume is decreased depending on the flow direction.

5. Improvement system of energy efficiency for the refrigeration cycle according to claim 4, wherein the dual flow control valve comprises a sleeve housing connected to each refrigerant pipe by each end of the sleeve housing;

two cylinders installed air-tightly in the housing, distanced against each other, and having two diameter bores in coaxial, and a conical area provided between the bores; and

two valve bodies having a different diameter orifice at each center, respectively, providing plural axial grooves at a circumstance of each larger diameter portion, the circumstances of each valve having a confronting conical area to the conical area of each cylinder, and sliding axially in the larger diameter bore of each cylinder in a predetermined stroke;

thereby each valve body moves any one direction simultaneously following the refrigerant flow direction, the grooves of any one valve body is contacted with the bore's conical area of the corresponding cylinder, and the refrigerant flow is blocked.

6. Improvement system of energy efficiency for the refrigeration cycle according to any one claim of claims 2 to 5, wherein the auxiliary heat exchanger unit further has a heater that heats refrigerant vapor having low pressure and low temperature, and the heater is selectively operated under a predetermined temperature.

7. Improvement system of energy efficiency for the refrigeration cycle according to claim 1, further comprising of a pressure compensator, consisting of a pressure compensation tank connecting to an inlet pipe of an expansion valve and storing an additional refrigerant; a first pressure check valve provided at an inlet pipe of the pressure compensation tank and being open only over the predetermined pressure of the refrigerant; and a second pressure check valve provided at an outlet pipe of the pressure compensation tank and being open only under the predetermined pressure of the refrigerant.

8. Improvement system of energy efficiency for the refrigeration cycle according to claim 6, further comprising of a pressure compensator provided between the auxiliary heat exchanger and the indoor heat exchanger, between the auxiliary heat exchanger and the outdoor heat exchanger, respectively, the pressure compensator consisting of a pressure compensation tank connecting to an inlet pipe of the expansion valve and storing an additional refrigerant; a first pressure check valve provided at an inlet pipe of the pressure compensation tank and being open only over the predetermined pressure of the refrigerant; and a second pressure check valve provided at an outlet pipe of the pressure compensation tank and being open only under the predetermined pressure of the refrigerant.

9. Improvement system of energy efficiency for the refrigeration cycle according to claim 8, wherein a refrigerant pipe is installed through the pressure compensation tank of the pressure compensator that operates during the heat mode.

10. Improvement system of energy efficiency for the refrigeration cycle according to claim 9, further comprising of an accumulator provided at an outer exit pipe of the heat exchanger unit for filtering moisture of refrigerant.

11. Improvement system of energy efficiency for the refrigeration cycle according to claim 1 or 2, wherein a joint is provided at both inner pipe ends of the heat exchanger unit and at both outer pipe ends of the heat exchanger unit.

12. Improvement system of energy efficiency for the refrigeration cycle in which refrigerant vapor having low pressure and low temperature is compressed into one having high pressure and high temperature and then is condensed by heat-exchange with a circumstance; a condensed refrigerant liquid is expanded and then is evaporated by heat-exchange with a circumstance, and by which a heating and a cooling are performed, comprising of:

an auxiliary heat exchanger unit making a heat-exchange between refrigerant liquid having high pressure and refrigerant vapor having low pressure, and the auxiliary heat exchanger comprises an inner pipe, one end of which is connected with an exit of the outdoor heat exchanger, the other end of which is connected with an inlet of the expansion valve; an outer pipe accommodating the inner pipe coaxially, one end of which is connected with an exit of the indoor heat exchanger, the other end of which is connected with an inlet of the compressor; and an insulation cover encompassing the outer pipe;

a first pressure support valve placed at an inlet of an inner pipe of the auxiliary heat exchanger unit, and for decreasing a pressure of the refrigerant liquid having high pressure condensed at the outdoor heat exchanger, and for maintaining condensed pressure of the outdoor heat exchanger;.

a 4 way valve for connecting an exit of the compressor, an inlet of the auxiliary heat exchanger unit, one end of the indoor heat exchanger and one end of the outdoor heat exchanger, and for converting flow direction of a refrigerant according to an operation mode;

a second expansion valve connected with one end of the inner pipe of the auxiliary heat exchanger unit, and for expanding a refrigerant condensed at the indoor heat exchanger; and

a second pressure support valve connected with the other end of the inner pipe of the auxiliary heat exchanger unit, a pressure of the refrigerant liquid having high pressure condensed at the outdoor heat exchanger is decreased by the pressure support valve, and a condensed pressure of the outdoor heat exchanger is maintained; and

a cabinet housing the auxiliary heat exchanger and the pressure support valve.